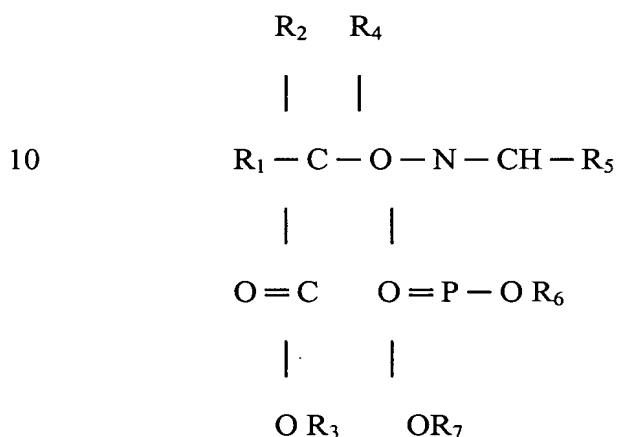


## CLAIMS

1. The use, as dispersant and/or grinding aid agent for pigments and/or mineral fillers in aqueous suspension, of a water soluble polymer, characterized in that said water soluble polymer has a controlled structure and is obtained by a controlled free radical polymerization method employing, as polymerization initiator, a particular alkoxyamine with the general formula (A):



15 where:

- R<sub>1</sub> and R<sub>2</sub> represent a linear or branched alkyl radical, with 1 to 5 carbon atoms,
- R<sub>3</sub> is a hydrogen atom, a linear or branched alkyl radical with 1 to 8 carbon atoms, a phenyl radical, a cation such as Li<sup>+</sup>, Na<sup>+</sup>, K<sup>+</sup>, H<sub>4</sub>N<sup>+</sup>, Bu<sub>3</sub>HN<sup>+</sup> with Bu = butyl,
- R<sub>4</sub> is a linear or branched alkyl radical with 1 to 8 carbon atoms, and preferably a tertbutyl radical,
- R<sub>5</sub> is a linear or branched alkyl radical with 1 to 8 carbon atoms, and preferably a tertbutyl radical,
- R<sub>6</sub> and R<sub>7</sub> represent a linear or branched alkyl radical with 1 to 8 carbon atoms, and preferably an ethyl radical.

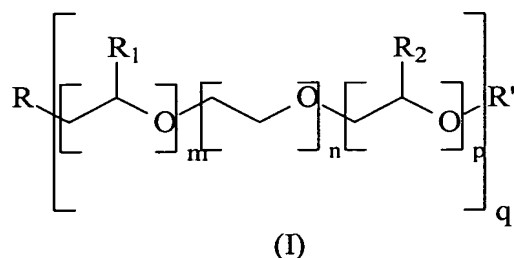
2. The use, as dispersant and/or grinding aid agent for pigments and/or mineral fillers in aqueous suspension, of the water soluble polymer according to claim 1,

characterized in that  $R_1$  and  $R_2$  represent the methyl radical and  $R_3$  is the hydrogen atom.

3. The use, as dispersant and/or grinding aid agent for pigments and/or mineral fillers in aqueous suspension, of the water soluble polymer according to any one of claims 1 or 2, characterized in that said polymer is a water soluble copolymer and has a random, block, comb, graft, or alternating type of structure.

4. The use, as dispersant and/or grinding aid agent for pigments and/or mineral fillers in aqueous suspension, of the water soluble polymer according to any one of claims 1 to 3, characterized in that said water soluble polymer and/or copolymer is obtained by the controlled free radical polymerization of monomers selected from:

- a) at least one ionic monomer, which is either
- i) anionic and with a carboxylic or dicarboxylic or phosphoric or phosphonic or sulfonic function or mixture thereof, or
  - ii) cationic, or
  - iii) the mixture of i) and ii)
- b) and possibly at least one nonionic monomer, the nonionic monomer consisting of at least one monomer with the formula (I):



where:

- m and p represent a number of alkylene oxide motifs less than or equal to 150,
- n is a number of ethylene oxide motifs less than or equal to 150,
- q is a whole number at least equal to 1 and such that  $5 \leq (m+n+p)q \leq 150$ ,  
5 and preferably such that  $15 \leq (m+n+p)q \leq 120$ ,
- $R_1$  is the hydrogen or the methyl or ethyl radical,
- $R_2$  is the hydrogen or the methyl or ethyl radical,
- R is a radical containing a polymerizable unsaturated function, preferably  
10 belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- 15  $R'$  is the hydrogen or a hydrocarbon radical with 1 to 40 carbon atoms, and is preferably a hydrocarbon radical with 1 to 12 carbon atoms and very preferably a hydrocarbon radical with 1 to 4 carbon atoms,

or the mixture of a plurality of monomers with the formula (I),

20

- c) and possibly at least one monomer of the acrylamide or methacrylamide type and mixtures thereof, or at least one non water soluble monomer such as the alkyl acrylates or methacrylates, the vinyl esters such as vinyl acetate, vinylpyrrolidone, styrene, alphasubstitutedstyrene and derivatives thereof, or at least  
25 one organofluorine or organosilicon monomer or mixtures thereof,

- d) and possibly at least one cross-linking monomer, or the mixture of a plurality of these monomers.

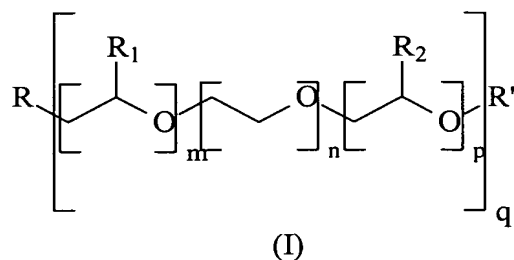
30 5. The use, as dispersant and/or grinding aid agent for pigments and/or mineral fillers in aqueous suspension, of the water soluble polymer according to any one of claims 1 to 4, characterized in that said water soluble polymer and/or copolymer is obtained by

the controlled free radical polymerization of monomers selected more particularly from:

- a) at least one ionic monomer which is either
  - i) anionic with ethylenic unsaturation and with a monocarboxylic function in the acidic or salified state selected from monomers with ethylenic unsaturation and with monocarboxylic function such as acrylic or methacrylic acid or diacid hemiesters such as the C<sub>1</sub> to C<sub>4</sub> monoesters of maleic or itaconic acids, or selected from the monomers with ethylenic unsaturation and dicarboxylic function in the acidic or salified state such as crotonic, isocrotonic, cinnamic, itaconic, maleic acid, or carboxylic acid anhydrides, such as maleic anhydride, or selected from monomers with ethylenic unsaturation and with a sulfonic function in the acidic or salified state such as acrylamido-methyl-propane-sulfonic acid, sodium methallylsulfonate, vinyl sulfonic acid and styrene sulfonic acid, or even selected from monomers with ethylenic unsaturation and with phosphoric function in the acidic or salified state such as vinyl phosphoric acid, ethylene glycol methacrylate phosphate, propylene glycol methacrylate phosphate, ethylene glycol acrylate phosphate, propylene glycol acrylate phosphate and ethoxylates thereof or even selected from monomers with ethylenic unsaturation and with phosphonic function in the acidic or salified state such as vinyl phosphonic acid or mixtures thereof, or
  - ii) cationic selected from N-[3-(dimethylamino) propyl] acrylamide or N-[3-(dimethylamino) propyl] methacrylamide, unsaturated esters such as N-[2-(dimethylamino) ethyl] methacrylate, or N-[2-(dimethylamino) ethyl] acrylate, or from quaternary ammoniums such as [2-(methacryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [2-(acryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [3-(acrylamido) propyl] trimethyl ammonium chloride or sulfate, dimethyl diallyl ammonium chloride or sulfate, [3-(methacrylamido) propyl] trimethyl ammonium chloride or sulfate, or mixtures thereof, or

- iii) the mixture of at least one of the above anionic monomers with at least one of the above cationic monomers

b) and possibly at least one monomer with nonionic ethylenic unsaturation with the formula (I):

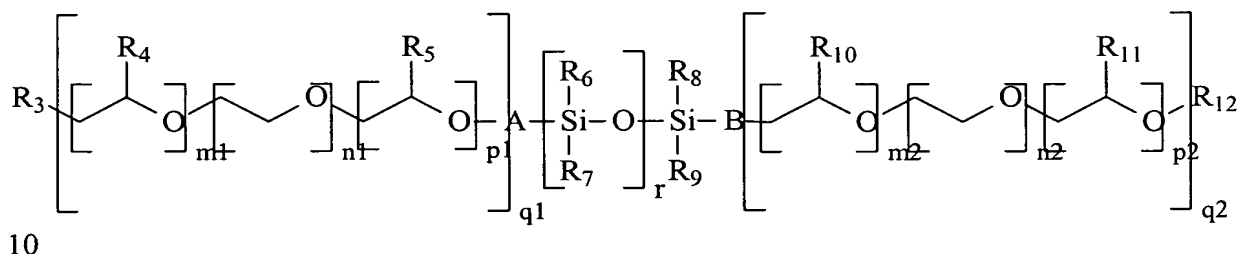


where:

- m and p represent a number of alkylene oxide motifs less than or equal to 150,
- n is a number of ethylene oxide motifs less than or equal to 150,
- q is a whole number at least equal to 1 and such that  $5 \leq (m+n+p)q \leq 150$ , and preferably such that  $15 \leq (m+n+p)q \leq 120$ ,
- R<sub>1</sub> is the hydrogen or the methyl or ethyl radical,
- R<sub>2</sub> is the hydrogen or the methyl or ethyl radical,
- R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane, α-α' dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- R' is the hydrogen or a hydrocarbon radical with 1 to 40 carbon atoms, and is preferably a hydrocarbon radical with 1 to 12 carbon atoms and very preferably a hydrocarbon radical with 1 to 4 carbon atoms,

or the mixture of a plurality of monomers with the formula (I),

- c) and possibly at least one monomer of the acrylamide or methacrylamide type and mixtures thereof, or at least one non water soluble monomer such as the alkyl acrylates or methacrylates, the vinyl esters such as vinyl acetate, vinylpyrrolidone, styrene, alphasubstituted styrene and derivatives thereof, or at least one organofluorine or organosilicon monomer selected preferably from the molecules with formulas (IIa) or (IIb):
- with formula (IIa)

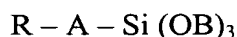


where:

- m1, p1, m2 and p2 represent a number of alkylene oxide motifs less than or equal to 150,
- n1 and n2 represent a number of ethylene oxide motifs less than or equal to 150,
- q1 and q2 represent a whole number at least equal to 1 and such that  $0 \leq (m1+n1+p1)q1 \leq 150$  and  $0 \leq (m2+n2+p2)q2 \leq 150$ ,
- r is a number such that  $1 \leq r \leq 200$ ,
- R<sub>3</sub> is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane, α-α' dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- R<sub>4</sub>, R<sub>5</sub>, R<sub>10</sub> and R<sub>11</sub>, represent hydrogen or the methyl or ethyl radical,

- R<sub>6</sub>, R<sub>7</sub>, R<sub>8</sub> and R<sub>9</sub>, represent linear or branched alkyl, or aryl, or alkylaryl, or arylalkyl groups with 1 to 20 carbon atoms, or mixtures thereof,
- R<sub>12</sub> is a hydrocarbon radical with 1 to 40 carbon atoms,
- A and B are groups that may be present, which then represent a hydrocarbon radical with 1 to 4 carbon atoms,

with the formula (IIb)



where:

- R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
  - A is a group that may be present, which then represents a hydrocarbon radical with 1 to 4 carbon atoms,
  - B is a hydrocarbon radical with 1 to 4 carbon atoms,
- or the mixture of a plurality of these monomers,

- d) and possibly at least one cross-linking monomer selected from the group consisting of ethylene glycol dimethacrylate, trimethylolpropanetriacrylate, allyl acrylate, allyl maleates, methylene-bis-acrylamide, methylene-bis-methacrylamide, tetraallyloxyethane, triallylcyanurates, allyl ethers obtained from polyols such as pentaerythritol, sorbitol, sucrose, or selected from molecules with the formula (III):

where :

- 5
- m3, p3, m4 and p4 represent a number of alkylene oxide motifs less than or equal to 150,
  - n3 and n4 represent a number of ethylene oxide motifs less than or equal to 150,
  - q3 and q4 represent a whole number at least equal to 1 and such that  $0 \leq (m3+n3+p3)q3 \leq 150$  and  $0 \leq (m4+n4+p4)q4 \leq 150$ ,
- 10
- r' is a number such that  $1 \leq r' \leq 200$ ,
  - R<sub>13</sub> is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,
- 15
- $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- 20
- R<sub>14</sub>, R<sub>15</sub>, R<sub>20</sub> and R<sub>21</sub>, represent hydrogen or the methyl or ethyl radical,
  - R<sub>16</sub>, R<sub>17</sub>, R<sub>18</sub> and R<sub>19</sub>, represent linear or branched alkyl, or aryl, or alkylaryl, or arylalkyl groups with 1 to 20 carbon atoms, or mixtures thereof,
  - D and E are groups that may be present, which then represent a hydrocarbon radical with 1 to 4 carbon atoms,

25 or the mixture of a plurality of these monomers.



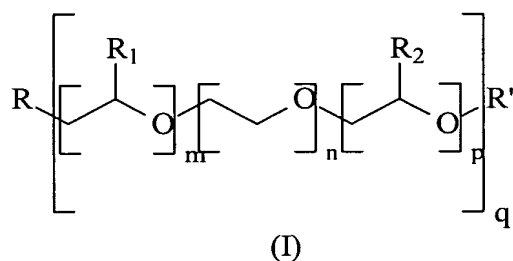
6. The use, as dispersant and/or grinding aid agent for pigments and/or mineral fillers, of the water soluble monomer according to one of claims 1 to 5, characterized in that said polymer consists of, expressed by weight:

- 5           a) 2% to 100% and even more particularly 5% to 100% of at least one ionic monomer, which is either
  - i) anionic with ethylenic unsaturation and with a monocarboxylic function in the acidic or salified state selected from monomers with ethylenic unsaturation and with monocarboxylic function such as acrylic or
 10           methacrylic acid or diacid hemiesters such as the C<sub>1</sub> to C<sub>4</sub> monoesters of maleic or itaconic acids, or selected from the monomers with ethylenic unsaturation and dicarboxylic function in the acidic or salified state such as crotonic, isocrotonic, cinnamic, itaconic, maleic acid, or carboxylic acid anhydrides, such as maleic anhydride or selected from
 15           monomers with ethylenic unsaturation and with a sulfonic function in the acidic or salified state such as acrylamido-methyl-propane-sulfonic acid, sodium methallylsulfonate, vinyl sulfonic acid and styrene sulfonic acid, or even selected from monomers with ethylenic unsaturation and with phosphoric function in the acidic or salified state such as vinyl phosphoric acid, ethylene glycol methacrylate phosphate, propylene glycol methacrylate phosphate, ethylene glycol acrylate phosphate, propylene glycol acrylate phosphate and ethoxylates thereof or even selected from monomers with ethylenic unsaturation and with phosphonic function in the acidic or salified state such as vinyl
 20           phosphonic acid or mixtures thereof, or
 25           ii) cationic selected from N-[3-(dimethylamino) propyl] acrylamide or N-[3-(dimethylamino) propyl] methacrylamide, unsaturated esters such as N-[2-(dimethylamino) ethyl] methacrylate, or N-[2-(dimethylamino) ethyl] acrylate, or from quaternary ammoniums such as [2-(methacryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [2-(acryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [3-(acrylamido) propyl] trimethyl ammonium chloride or sulfate, dimethyl
 30

- diallyl ammonium chloride or sulfate, [3-(methacrylamido) propyl] trimethyl ammonium chloride or sulfate, or mixtures thereof, or
- iii) the mixture of at least one of the above anionic monomers with at least one of the above cationic monomers,

5

- b) 0 to 98% and even or particularly 0% to 96% of at least one monomer with nonionic ethylenic unsaturation with the formula (I):



10

where:

- m and p represent a number of alkylene oxide motifs less than or equal to 150,
- n is a number of ethylene oxide motifs less than or equal to 150,
- q is a whole number at least equal to 1 and such that  $5 \leq (m+n+p)q \leq 150$ ,  
and preferably such that  $15 \leq (m+n+p)q \leq 120$ ,
- $\text{R}_1$  is the hydrogen or the methyl or ethyl radical,
- $\text{R}_2$  is the hydrogen or the methyl or ethyl radical,
- R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- $\text{R}'$  is the hydrogen or a hydrocarbon radical with 1 to 40 carbon atoms, and is preferably a hydrocarbon radical with 1 to 12 carbon atoms and very preferably a hydrocarbon radical with 1 to 4 carbon atoms,

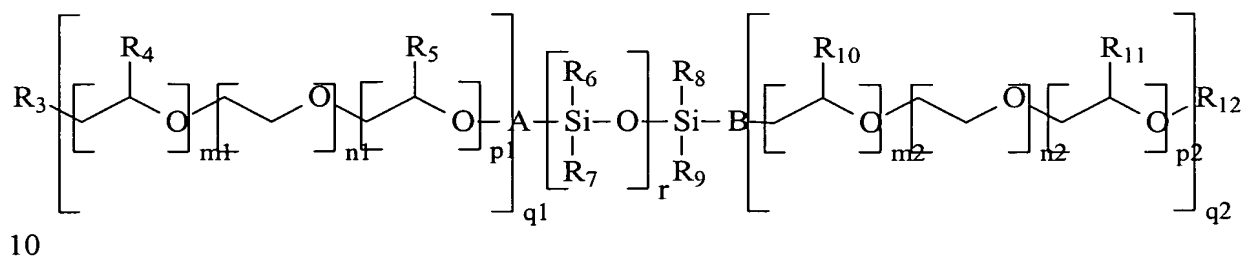
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25

or the mixture of a plurality of monomers with the formula (I),

- c) 0% to 50% of at least one monomer of the acrylamide or methacrylamide type and mixtures thereof, or at least one non water soluble monomer such as the alkyl acrylates or methacrylates, the vinyl esters such as vinyl acetate, vinylpyrrolidone, styrene, alphanethylstyrene and derivatives thereof, or at least one organofluorine or organosilicon monomer selected preferably from the molecules with formulas (IIa) or (IIb):

with formula (IIa)

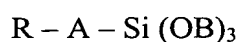


where:

- m1, p1, m2 and p2 represent a number of alkylene oxide motifs less than or equal to 150,
- n1 and n2 represent a number of ethylene oxide motifs less than or equal to 150,
- q1 and q2 represent a whole number at least equal to 1 and such that  $0 \leq (m1+n1+p1)q1 \leq 150$  and  $0 \leq (m2+n2+p2)q2 \leq 150$ ,
- r is a number such that  $1 \leq r \leq 200$ ,
- R<sub>3</sub> is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane, α-α' dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,

- R<sub>4</sub>, R<sub>5</sub>, R<sub>10</sub> and R<sub>11</sub>, represent hydrogen or the methyl or ethyl radical,
- R<sub>6</sub>, R<sub>7</sub>, R<sub>8</sub> and R<sub>9</sub>, represent linear or branched alkyl, or aryl, or alkylaryl, or arylalkyl groups with 1 to 20 carbon atoms, or mixtures thereof,
- R<sub>12</sub> is a hydrocarbon radical with 1 to 40 carbon atoms,
- 5      - A and B are groups that may be present, which then represent a hydrocarbon radical with 1 to 4 carbon atoms,

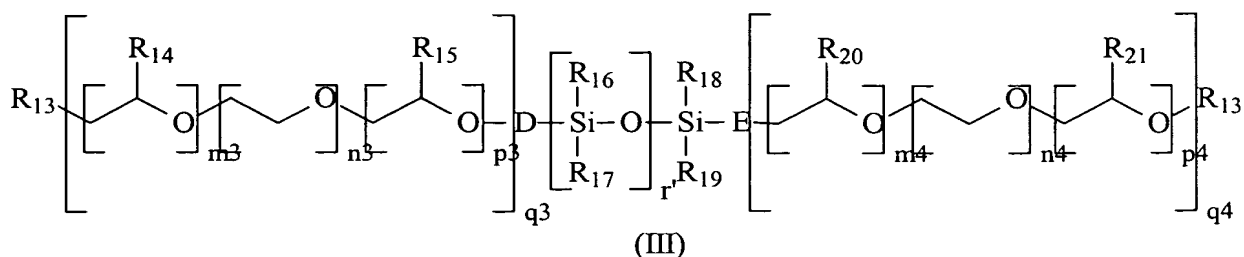
with the formula (IIb)



10      where:

- R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
  - 15      - A is a group that may be present, which then represents a hydrocarbon radical with 1 to 4 carbon atoms,
  - 20      - B is a hydrocarbon radical with 1 to 4 carbon atoms,
- or the mixture of a plurality of these monomers,

- d) 0 to 3% of at least one cross-linking monomer selected from the group consisting of ethylene glycol dimethacrylate, trimethylolpropanetriacrylate, allyl acrylate, allyl maleates, methylene-bis-acrylamide, methylene-bis-methacrylamide, 25      tetraallyloxyethane, triallylcyanurates, allyl ethers obtained from polyols such as pentaerythritol, sorbitol, sucrose, or selected from molecules with the formula (III):

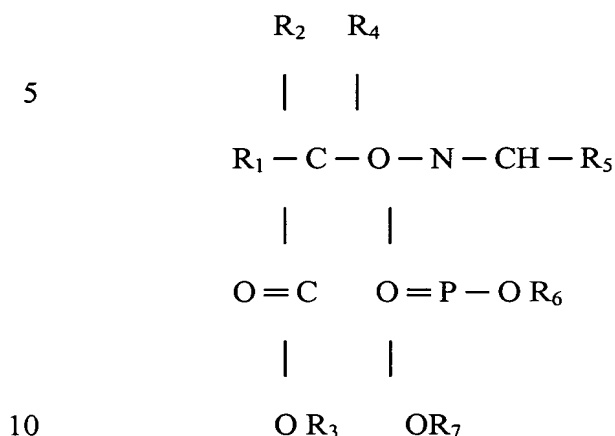


where:

- m3, p3, m4 and p4 represent a number of alkylene oxide motifs less than or equal to 150,
  - 5      - n3 and n4 represent a number of ethylene oxide motifs less than or equal to 150,
  - q3 and q4 represent a whole number at least equal to 1 and such that  $0 \leq (m3+n3+p3)q3 \leq 150$  and  $0 \leq (m4+n4+p4)q4 \leq 150$ ,
  - r' is a number such that  $1 \leq r' \leq 200$ ,
  - 10      - R<sub>13</sub> is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane, α-α' dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the
  - 15      group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
  - R<sub>14</sub>, R<sub>15</sub>, R<sub>20</sub> and R<sub>21</sub>, represent hydrogen or the methyl or ethyl radical,
  - R<sub>16</sub>, R<sub>17</sub>, R<sub>18</sub> and R<sub>19</sub>, represent linear or branched alkyl, or aryl, or alkylaryl, or arylalkyl groups with 1 to 20 carbon atoms, or mixtures thereof,
  - 20      - D and E are groups that may be present, which then represent a hydrocarbon radical with 1 to 4 carbon atoms,
- or the mixture of a plurality of these monomers.

25      7. A dispersant and/or grinding aid agent for pigments and/or mineral fillers in aqueous suspension, characterized in that it is a water soluble polymer with a controlled structure and is obtained by a controlled free radical polymerization method

employing, as polymerization initiator, a particular alkoxyamine with the general formula (A):



where:

- R<sub>1</sub> and R<sub>2</sub> represent a linear or branched alkyl radical, with 1 to 5 carbon atoms,
- R<sub>3</sub> is a hydrogen atom, a linear or branched alkyl radical with 1 to 8 carbon atoms, a phenyl radical, a cation such as Li<sup>+</sup>, Na<sup>+</sup>, K<sup>+</sup>, H<sub>4</sub>N<sup>+</sup>, Bu<sub>3</sub>HN<sup>+</sup> with Bu = butyl,
- R<sub>4</sub> is a linear or branched alkyl radical with 1 to 8 carbon atoms, and preferably a tertbutyl radical,
- R<sub>5</sub> is a linear or branched alkyl radical with 1 to 8 carbon atoms, and preferably a tertbutyl radical,
- R<sub>6</sub> and R<sub>7</sub> represent a linear or branched alkyl radical with 1 to 8 carbon atoms, and preferably an ethyl radical.

8. A dispersant for pigments and/or mineral fillers in aqueous suspension, characterized in that R<sub>1</sub> and R<sub>2</sub> represent the methyl radical and R<sub>3</sub> is the hydrogen atom.

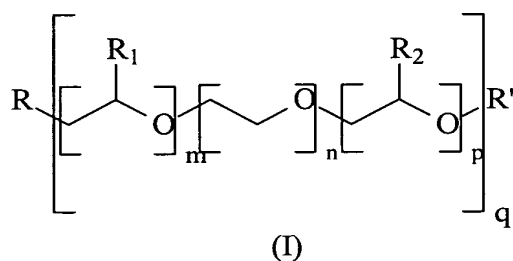
9. The dispersant for pigments and/or mineral fillers in aqueous suspension, according to either one of claims 7 or 8, characterized in that said polymer is a water soluble copolymer and has a random, block, comb, graft, or alternating type of structure.

- 5 10. The dispersant for pigments and/or mineral fillers in aqueous suspension, according to any one of claims 7 to 9, characterized in that said water soluble polymer is obtained by the controlled free radical polymerization of monomers selected from:

a) at least one ionic monomer, which is either

- 10            i)        anionic and with a carboxylic or dicarboxylic or phosphoric or phosphonic or sulfonic function or mixture thereof, or  
               ii)        cationic, or  
               iii)        the mixture of i) and ii)

- 15            b) and possibly at least one nonionic monomer, the nonionic monomer consisting of at least one monomer with the formula (I):



where:

- 20            -    m and p represent a number of alkylene oxide motifs less than or equal to 150,  
               -    n is a number of ethylene oxide motifs less than or equal to 150,  
               -    q is a whole number at least equal to 1 and such that  $5 \leq (m+n+p)q \leq 150$ ,  
                     and preferably such that  $15 \leq (m+n+p)q \leq 120$ ,  
 25            -    R<sub>1</sub> is the hydrogen or the methyl or ethyl radical,  
               -    R<sub>2</sub> is the hydrogen or the methyl or ethyl radical,

- R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- R' is the hydrogen or a hydrocarbon radical with 1 to 40 carbon atoms, and is preferably a hydrocarbon radical with 1 to 12 carbon atoms and very preferably a hydrocarbon radical with 1 to 4 carbon atoms,

or the mixture of a plurality of monomers with the formula (I),

- c) and possibly at least one monomer of the acrylamide or methacrylamide type and mixtures thereof, or at least one non water soluble monomer such as the alkyl acrylates or methacrylates, the vinyl esters such as vinyl acetate, vinylpyrrolidone, styrene, alphanethylstyrene and derivatives thereof, or at least one organofluorine or organosilicon monomer or mixtures thereof,
- d) and possibly at least one cross-linking monomer, or the mixture of a plurality of these monomers.

11. The dispersant for pigments and/or mineral fillers in aqueous suspension, according to any one of claims 7 to 10, characterized in that said water soluble polymer is obtained by the controlled free radical polymerization of monomers selected more particularly from:

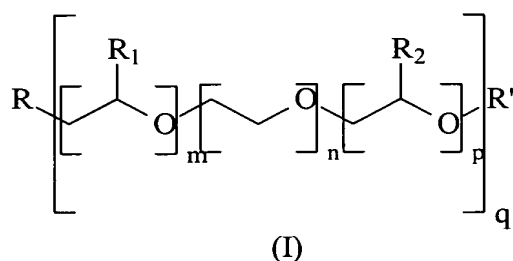
- a) at least one ionic monomer which is either
  - i) anionic with ethylenic unsaturation and with a monocarboxylic function in the acidic or salified state selected from monomers with ethylenic unsaturation and with monocarboxylic function such as acrylic or methacrylic acid or diacid hemiesters such as the  $C_1$  to  $C_4$  monoesters of



- maleic or itaconic acids, or selected from the monomers with ethylenic unsaturation and dicarboxylic function in the acidic or salified state such as crotonic, isocrotonic, cinnamic, itaconic, maleic acid, or carboxylic acid anhydrides, such as maleic anhydride or selected from monomers with
- 5 ethylenic unsaturation and with a sulfonic function in the acidic or salified state such as acrylamido-methyl-propane-sulfonic acid, sodium methallylsulfonate, vinyl sulfonic acid and styrene sulfonic acid, or even selected from monomers with ethylenic unsaturation and with phosphoric function in the acidic or salified state such as vinyl phosphoric acid,
- 10 ethylene glycol methacrylate phosphate, propylene glycol methacrylate phosphate, ethylene glycol acrylate phosphate, propylene glycol acrylate phosphate and ethoxylates thereof or even selected from monomers with ethylenic unsaturation and with phosphonic function in the acidic or salified state such as vinyl phosphonic acid or mixtures thereof, or
- 15
- ii) cationic selected from N-[3-(dimethylamino) propyl] acrylamide or N-[3-(dimethylamino) propyl] methacrylamide, unsaturated esters such as N-[2-(dimethylamino) ethyl] methacrylate, or N-[2-(dimethylamino) ethyl] acrylate, or from quaternary ammoniums
- 20 such as [2-(methacryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [2-(acryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [3-(acrylamido) propyl] trimethyl ammonium chloride or sulfate, dimethyl diallyl ammonium chloride or sulfate, [3-(methacrylamido) propyl] trimethyl ammonium chloride or sulfate,
- 25 or mixtures thereof, or
- iii) the mixture of at least one of the above anionic monomers with at least one of the above cationic monomers

b) and possibly at least one monomer with nonionic ethylenic unsaturation with the

30 formula (I):



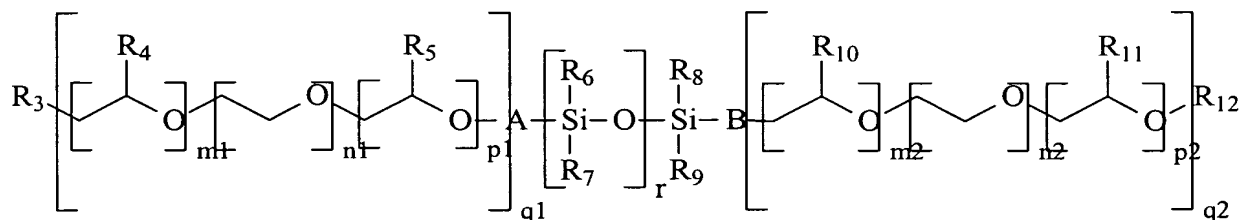
where:

- m and p represent a number of alkylene oxide motifs less than or equal to 150,
- n is a number of ethylene oxide motifs less than or equal to 150,
- q is a whole number at least equal to 1 and such that  $5 \leq (m+n+p)q \leq 150$ , and preferably such that  $15 \leq (m+n+p)q \leq 120$ ,
- R<sub>1</sub> is the hydrogen or the methyl or ethyl radical,
- R<sub>2</sub> is the hydrogen or the methyl or ethyl radical,
- R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane, α-α' dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- R' is the hydrogen or a hydrocarbon radical with 1 to 40 carbon atoms, and is preferably a hydrocarbon radical with 1 to 12 carbon atoms and very preferably a hydrocarbon radical with 1 to 4 carbon atoms,

or the mixture of a plurality of monomers with the formula (I),

- c) and possibly at least one monomer of the acrylamide or methacrylamide type and mixtures thereof, or at least one non water soluble monomer such as the alkyl acrylates or methacrylates, the vinyl esters such as vinyl acetate, vinylpyrrolidone, styrene, alphasubstitutedstyrene and derivatives thereof, or at least one organofluorine or

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where:

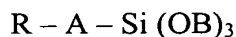
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with the formula (IIb)



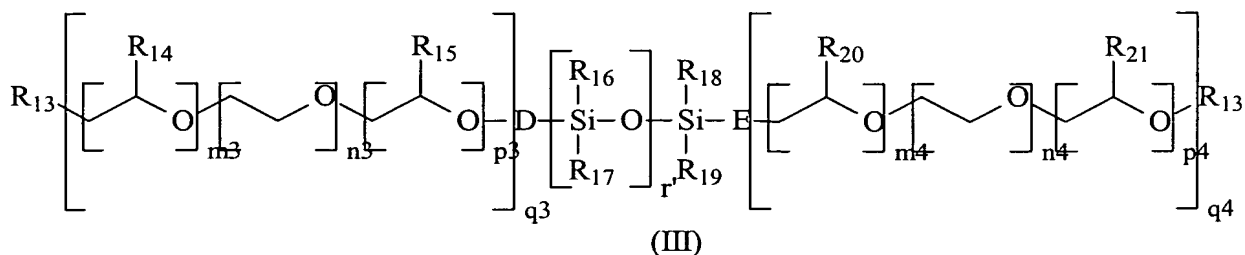
where:

- 5        - R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group
- 10       of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- A is a group that may be present, which then represents a hydrocarbon radical with 1 to 4 carbon atoms,
- B is a hydrocarbon radical with 1 to 4 carbon atoms,

15

or the mixture of a plurality of these monomers,

- d) and possibly at least one cross-linking monomer selected from the group consisting of ethylene glycol dimethacrylate, trimethylolpropanetriacrylate, allyl
- 20       acrylate, allyl maleates, methylene-bis-acrylamide, methylene-bis-methacrylamide, tetraallyloxyethane, triallylcyanurates, allyl ethers obtained from polyols such as pentaerythritol, sorbitol, sucrose, or selected from molecules with the formula (III) :



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where:

- m3, p3, m4 and p4 represent a number of alkylene oxide motifs less than or equal to 150,
- n3 and n4 represent a number of ethylene oxide motifs less than or equal to 150,
- 5      - q3 and q4 represent a whole number at least equal to 1 and such that  $0 \leq (m3+n3+p3)q3 \leq 150$  and  $0 \leq (m4+n4+p4)q4 \leq 150$ ,
- r' is a number such that  $1 \leq r' \leq 200$ ,
- R<sub>13</sub> is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- 10      - R<sub>14</sub>, R<sub>15</sub>, R<sub>20</sub> and R<sub>21</sub>, represent hydrogen or the methyl or ethyl radical,
- R<sub>16</sub>, R<sub>17</sub>, R<sub>18</sub> and R<sub>19</sub>, represent linear or branched alkyl, or aryl, or alkylaryl, or arylalkyl groups with 1 to 20 carbon atoms, or mixtures thereof,
- 15      - D and E are groups that may be present, which then represent a hydrocarbon radical with 1 to 4 carbon atoms,
- 20      or the mixture of a plurality of these monomers.

12. The dispersant for pigments and/or mineral fillers, according to one of claims 7 to 11, characterized in that said water soluble polymer consists of, expressed by weight:

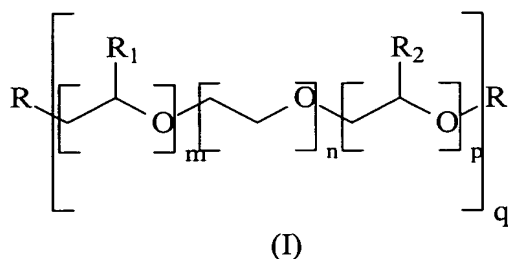
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a) 2% to 100% and even more particularly 5% to 100% of at least one ionic monomer, which is either

- i) anionic with ethylenic unsaturation and with a monocarboxylic function in the acidic or salified state selected from monomers with ethylenic unsaturation and with monocarboxylic function such as acrylic or methacrylic acid or diacid hemiesters such as the C<sub>1</sub> to C<sub>4</sub> monoesters of maleic or itaconic acids, or selected from the
- 30

- monomers with ethylenic unsaturation and dicarboxylic function in the acidic or salified state such as crotonic, isocrotonic, cinnamic, itaconic, maleic acid, or carboxylic acid anhydrides, such as maleic anhydride or selected from monomers with ethylenic unsaturation and with a sulfonic function in the acidic or salified state such as acrylamido-methyl-propane-sulfonic acid, sodium methallylsulfonate, vinyl sulfonic acid and styrene sulfonic acid, or even selected from monomers with ethylenic unsaturation and with phosphoric function in the acidic or salified state such as vinyl phosphoric acid, ethylene glycol methacrylate phosphate, propylene glycol methacrylate phosphate, ethylene glycol acrylate phosphate, propylene glycol acrylate phosphate and ethoxylates thereof or even selected from monomers with ethylenic unsaturation and with phosphonic function in the acidic or salified state such as vinyl phosphonic acid or mixtures thereof, or
- ii) selected from N-[3-(dimethylamino) propyl] acrylamide or N-[3-(dimethylamino) propyl] methacrylamide, unsaturated esters such as N-[2-(dimethylamino) ethyl] methacrylate, or N-[2-(dimethylamino) ethyl] acrylate, or from quaternary ammoniums such as [2-(methacryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [2-(acryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [3-(acrylamido) propyl] trimethyl ammonium chloride or sulfate, dimethyl diallyl ammonium chloride or sulfate, [3-(methacrylamido) propyl] trimethyl ammonium chloride or sulfate, or mixtures thereof, or
- iii) the mixture of at least one of the above anionic monomers with at least one of the above cationic monomers,

b) 0 to 98% and even or particularly 0 to 96% of at least one monomer with nonionic ethylenic unsaturation with the formula (I):



where:

- m and p represent a number of alkylene oxide motifs less than or equal to 150,
- 5      - n is a number of ethylene oxide motifs less than or equal to 150,
- q is a whole number at least equal to 1 and such that  $5 \leq (m+n+p)q \leq 150$ , and preferably such that  $15 \leq (m+n+p)q \leq 120$ ,
- R<sub>1</sub> is the hydrogen or the methyl or ethyl radical,
- R<sub>2</sub> is the hydrogen or the methyl or ethyl radical,
- 10      - R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane, α-α' dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group
- 15      of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- R' is the hydrogen or a hydrocarbon radical with 1 to 40 carbon atoms, and is preferably a hydrocarbon radical with 1 to 12 carbon atoms and very preferably a hydrocarbon radical with 1 to 4 carbon atoms,

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or the mixture of a plurality of monomers with the formula (I),

- c) 0% to 50% of at least one monomer of the acrylamide or methacrylamide type and mixtures thereof, or at least one non water soluble monomer such as the alkyl
- 25      acrylates or methacrylates, the vinyl esters such as vinyl acetate, vinylpyrrolidone, styrene, alphanethylstyrene and derivatives thereof, or at least one organofluorine or

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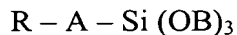
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with the formula (IIb)

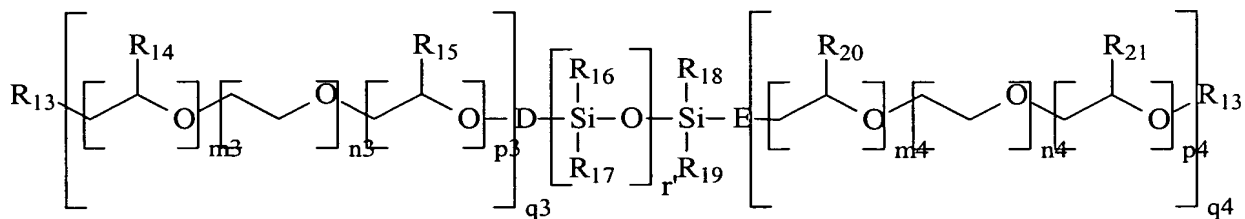


5 where:

- R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- A is a group that may be present, which then represents a hydrocarbon radical with 1 to 4 carbon atoms,
- 15 - B is a hydrocarbon radical with 1 to 4 carbon atoms,

or the mixture of a plurality of these monomers,

d) 0 to 3% of at least one cross-linking monomer selected from the group consisting of  
 20 ethylene glycol dimethacrylate, trimethylolpropanetriacrylate, allyl acrylate, allyl maleates, methylene-bis-acrylamide, methylene-bis-methacrylamide, tetraallyloxyethane, triallylcyanurates, allyl ethers obtained from polyols such as pentaerythritol, sorbitol, sucrose, or selected from molecules with the formula (III):



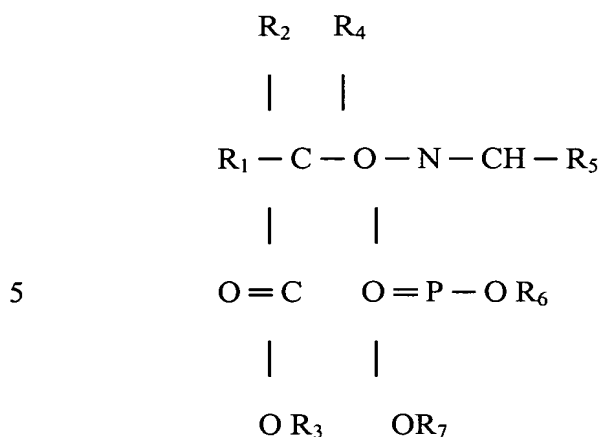
(III)

where:

- m3, p3, m4 and p4 represent a number of alkylene oxide motifs less than or equal to 150,
- n3 and n4 represent a number of ethylene oxide motifs less than or equal to 150,
- 5      - q3 and q4 represent a whole number at least equal to 1 and such that  $0 \leq (m3+n3+p3)q3 \leq 150$  and  $0 \leq (m4+n4+p4)q4 \leq 150$ ,
- r' is a number such that  $1 \leq r' \leq 200$ ,
- R<sub>13</sub> is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- 10      - R<sub>14</sub>, R<sub>15</sub>, R<sub>20</sub> and R<sub>21</sub>, represent hydrogen or the methyl or ethyl radical,
- R<sub>16</sub>, R<sub>17</sub>, R<sub>18</sub> and R<sub>19</sub>, represent linear or branched alkyl, or aryl, or alkylaryl, or arylalkyl groups with 1 to 20 carbon atoms, or mixtures thereof,
- 15      - D and E are groups that may be present, which then represent a hydrocarbon radical with 1 to 4 carbon atoms,
- 20      or the mixture of a plurality of these monomers.

13. A grinding aid agent for pigments and/or mineral fillers in aqueous suspension, characterized in that it is a water soluble polymer with a controlled structure and is obtained by a controlled free radical polymerization method employing, as polymerization initiator, a particular alkoxyamine with the general formula (A):

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where:

- $\text{R}_1$  and  $\text{R}_2$  represent a linear or branched alkyl radical, with 1 to 5 carbon atoms,
- $\text{R}_3$  is a hydrogen atom, a linear or branched alkyl radical with 1 to 8 carbon atoms, a phenyl radical, a cation such as  $\text{Li}^+$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{H}_4\text{N}^+$ ,  $\text{Bu}_3\text{HN}^+$  with Bu = butyl,
- $\text{R}_4$  is a linear or branched alkyl radical with 1 to 8 carbon atoms, and preferably a tertbutyl radical,
- $\text{R}_5$  is a linear or branched alkyl radical with 1 to 8 carbon atoms, and preferably a tertbutyl radical,
- $\text{R}_6$  and  $\text{R}_7$  represent a linear or branched alkyl radical with 1 to 8 carbon atoms, and preferably an ethyl radical.

14. The grinding aid agent for pigments and/or mineral fillers in aqueous suspension, according to claim 13, characterized in that  $\text{R}_1$  and  $\text{R}_2$  represent the methyl radical and  $\text{R}_3$  is the hydrogen atom.

15. The grinding aid agent for pigments and/or mineral fillers in aqueous suspension, according to either one of claims 13 or 14, characterized in that said polymer is a water soluble copolymer and has a random, block, comb, graft, or alternating type of structure.

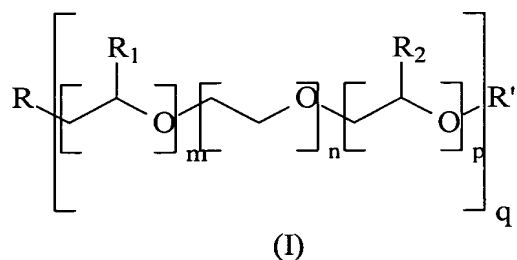
16. The grinding aid agent for pigments and/or mineral fillers in aqueous suspension, according to any one of claims 13 to 15, characterized in that said water soluble polymer is obtained by the controlled free radical polymerization of monomers selected from:

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a) at least one ionic monomer, which is either

- i) anionic and with a carboxylic or dicarboxylic or phosphoric or phosphonic or sulfonic function or mixture thereof, or
- ii) cationic, or
- 10 iii) the mixture of i) and ii)

b) and possibly at least one nonionic monomer, the nonionic monomer consisting of at least one monomer with the formula (I):



15

where:

- m and p represent a number of alkylene oxide motifs less than or equal to 150,
- n is a number of ethylene oxide motifs less than or equal to 150,
- 20 - q is a whole number at least equal to 1 and such that  $5 \leq (m+n+p)q \leq 150$ , and preferably such that  $15 \leq (m+n+p)q \leq 120$ ,
- R<sub>1</sub> is the hydrogen or the methyl or ethyl radical,
- R<sub>2</sub> is the hydrogen or the methyl or ethyl radical,
- R is a radical containing a polymerizable unsaturated function, preferably
- 25 belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of

unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,

- 5        - R' is the hydrogen or a hydrocarbon radical with 1 to 40 carbon atoms, and is preferably a hydrocarbon radical with 1 to 12 carbon atoms and very preferably a hydrocarbon radical with 1 to 4 carbon atoms,

or the mixture of a plurality of monomers with the formula (I),

10

c) and possibly at least one monomer of the acrylamide or methacrylamide type and mixtures thereof, or at least one non water soluble monomer such as the alkyl acrylates or methacrylates, the vinyl esters such as vinyl acetate, vinylpyrrolidone, styrene, alphanethylstyrene and derivatives thereof, or at least one organofluorine or

15        organosilicon monomer or mixtures thereof,

d) and possibly at least one cross-linking monomer, or the mixture of a plurality of these monomers.

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17. The grinding aid agent for pigments and/or mineral fillers in aqueous suspension, according to any one of claims 13 to 16, characterized in that said water soluble polymer is obtained by the controlled free radical polymerization of monomers selected more particularly from:

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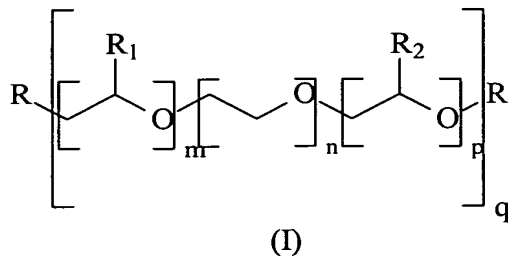
a) at least one ionic monomer which is either

- i) anionic with ethylenic unsaturation and with a monocarboxylic function in the acidic or salified state selected from monomers with ethylenic unsaturation and with monocarboxylic function such as acrylic or methacrylic acid or diacid hemiesters such as the C<sub>1</sub> to C<sub>4</sub> monoesters of maleic or itaconic acids, or
- 30        selected from the monomers with ethylenic unsaturation and dicarboxylic function in the acidic or salified state such as crotonic, isocrotonic, cinnamic,

itaconic, maleic acid, or carboxylic acid anhydrides, such as maleic anhydride or selected from monomers with ethylenic unsaturation and with a sulfonic function in the acidic or salified state such as acrylamido-methyl-propane-sulfonic acid, sodium methallylsulfonate, vinyl sulfonic acid and styrene sulfonic acid, or even selected from monomers with ethylenic unsaturation and with phosphoric function in the acidic or salified state such as vinyl phosphoric acid, ethylene glycol methacrylate phosphate, propylene glycol methacrylate phosphate, ethylene glycol acrylate phosphate, propylene glycol acrylate phosphate and ethoxylates thereof or even selected from monomers with ethylenic unsaturation and with phosphonic function in the acidic or salified state such as vinyl phosphonic acid or mixtures thereof, or

- ii) cationic selected from N-[3-(dimethylamino) propyl] acrylamide or N-[3-(dimethylamino) propyl] methacrylamide, unsaturated esters such as N-[2-(dimethylamino) ethyl] methacrylate, or N-[2-(dimethylamino) ethyl] acrylate, or from quaternary ammoniums such as [2-(methacryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [2-(acryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [3-(acrylamido) propyl] trimethyl ammonium chloride or sulfate, dimethyl diallyl ammonium chloride or sulfate, [3-(methacrylamido) propyl] trimethyl ammonium chloride or sulfate, or mixtures thereof, or
- iii) the mixture of at least one of the above anionic monomers with at least one of the above cationic monomers

b) and possibly at least one monomer with nonionic ethylenic unsaturation with the formula (I):



where:

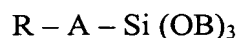
c) and possibly at least one monomer of the acrylamide or methacrylamide type and mixtures thereof, or at least one non water soluble monomer such as the alkyl acrylates or methacrylates, the vinyl esters such as vinyl acetate, vinylpyrrolidone, styrene, aliphatic styrene and derivatives thereof, or at least one organofluorine or organosilicon monomer selected preferably from the molecules with formulas (IIa) or (IIb):

$$\begin{array}{c} \text{R}_3 \left[ \begin{array}{c} \text{R}_4 \\ | \\ \text{---} \text{CH} \text{---} \text{CH}_2 \text{---} \text{O} \text{---} \end{array} \right]_{m1} \left[ \begin{array}{c} \text{R}_5 \\ | \\ \text{---} \text{CH} \text{---} \text{CH}_2 \text{---} \text{O} \text{---} \end{array} \right]_{n1} \left[ \begin{array}{c} \text{R}_6 \\ | \\ \text{---} \text{CH} \text{---} \text{CH}_2 \text{---} \text{O} \text{---} \end{array} \right]_{p1} \left[ \begin{array}{c} \text{R}_7 \\ | \\ \text{---} \text{CH} \text{---} \text{CH}_2 \text{---} \text{O} \text{---} \end{array} \right]_{q1} \text{A} \left[ \begin{array}{c} \text{R}_6 \\ | \\ \text{---} \text{Si} \text{---} \text{O} \text{---} \\ | \\ \text{R}_7 \end{array} \right]_{r} \left[ \begin{array}{c} \text{R}_8 \\ | \\ \text{---} \text{Si} \text{---} \text{O} \text{---} \\ | \\ \text{R}_9 \end{array} \right]_{r} \text{B} \left[ \begin{array}{c} \text{R}_{10} \\ | \\ \text{---} \text{CH} \text{---} \text{CH}_2 \text{---} \text{O} \text{---} \end{array} \right]_{m2} \left[ \begin{array}{c} \text{R}_{11} \\ | \\ \text{---} \text{CH} \text{---} \text{CH}_2 \text{---} \text{O} \text{---} \end{array} \right]_{n2} \left[ \begin{array}{c} \text{R}_{12} \\ | \\ \text{---} \text{CH} \text{---} \text{CH}_2 \text{---} \text{O} \text{---} \end{array} \right]_{p2} \left[ \begin{array}{c} \text{R}_{13} \\ | \\ \text{---} \text{CH} \text{---} \text{CH}_2 \text{---} \text{O} \text{---} \end{array} \right]_{q2} \end{array}$$

where:

- m1, p1, m2 and p2 represent a number of alkylene oxide motifs less than or equal to 150,
- n1 and n2 represent a number of ethylene oxide motifs less than or equal to 150,
- q1 and q2 represent a whole number at least equal to 1 and such that  $0 \leq (m1+n1+p1)q1 \leq 150$  and  $0 \leq (m2+n2+p2)q2 \leq 150$ ,
- r is a number such that  $1 \leq r \leq 200$ ,
- R<sub>3</sub> is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- R<sub>4</sub>, R<sub>5</sub>, R<sub>10</sub> and R<sub>11</sub>, represent hydrogen or the methyl or ethyl radical,
- R<sub>6</sub>, R<sub>7</sub>, R<sub>8</sub> and R<sub>9</sub>, represent linear or branched alkyl, or aryl, or alkylaryl, or arylalkyl groups with 1 to 20 carbon atoms, or mixtures thereof,
- R<sub>12</sub> is a hydrocarbon radical with 1 to 40 carbon atoms,
- A and B are groups that may be present, which then represent a hydrocarbon radical with 1 to 4 carbon atoms,

with the formula (IIb)



where:

- R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group





group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,

- R<sub>14</sub>, R<sub>15</sub>, R<sub>20</sub> and R<sub>21</sub>, represent hydrogen or the methyl or ethyl radical,
- R<sub>16</sub>, R<sub>17</sub>, R<sub>18</sub> and R<sub>19</sub>, represent linear or branched alkyl, or aryl, or alkylaryl, or arylalkyl groups with 1 to 20 carbon atoms, or mixtures thereof,
- D and E are groups that may be present, which then represent a hydrocarbon radical with 1 to 4 carbon atoms,

or the mixture of a plurality of these monomers.

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18. The grinding aid agent for pigments and/or mineral fillers, according to one of claims 13 to 17, characterized in that said water soluble polymer consists of, expressed by weight:

- 15      a) 2% to 100% and even more particularly 5% to 100% of at least one ionic monomer, which is either

- i)      anionic with ethylenic unsaturation and with a monocarboxylic function in the acidic or salified state selected from monomers with ethylenic unsaturation and with monocarboxylic function such as acrylic or methacrylic acid or diacid hemiesters such as the C<sub>1</sub> to C<sub>4</sub> monoesters of maleic or itaconic acids, or selected from the monomers with ethylenic unsaturation and dicarboxylic function in the acidic or salified state such as crotonic, isocrotonic, cinnamic, itaconic, maleic acid, or carboxylic acid anhydrides, such as maleic anhydride or selected from monomers with ethylenic unsaturation and with a sulfonic function in the acidic or salified state such as acrylamido-methyl-propane-sulfonic acid, sodium methallylsulfonate, vinyl sulfonic acid and styrene sulfonic acid, or even selected from monomers with ethylenic unsaturation and with phosphoric function in the acidic or salified state such as vinyl phosphoric acid, ethylene glycol methacrylate phosphate, propylene glycol methacrylate phosphate, ethylene glycol acrylate phosphate,

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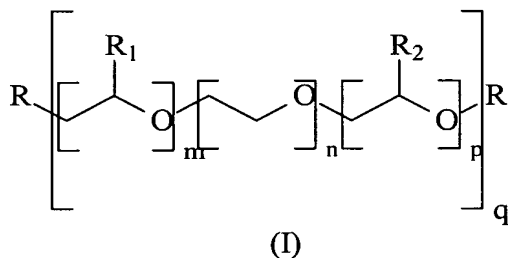
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propylene glycol acrylate phosphate and ethoxylates thereof or even selected from monomers with ethylenic unsaturation and with phosphonic function in the acidic or salified state such as vinyl phosphonic acid or mixtures thereof, or

- 5                    ii) selected from N-[3-(dimethylamino) propyl] acrylamide or N-[3-(dimethylamino) propyl] methacrylamide, unsaturated esters such as N-[2-(dimethylamino) ethyl] methacrylate, or N-[2-(dimethylamino) ethyl] acrylate, or from quaternary ammoniums such as [2-(methacryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [2-(acryloyloxy) ethyl] trimethyl ammonium chloride or sulfate, [3-(acrylamido) propyl] trimethyl ammonium chloride or sulfate, dimethyl diallyl ammonium chloride or sulfate, [3-(methacrylamido) propyl] trimethyl ammonium chloride or sulfate, or mixtures thereof, or
- 10                   iii) the mixture of at least one of the above anionic monomers with at least one of the above cationic monomers,
- 15

b) 0 to 98% and even or particularly 0% to 96% of at least one monomer with nonionic ethylenic unsaturation with the formula (I):



where:

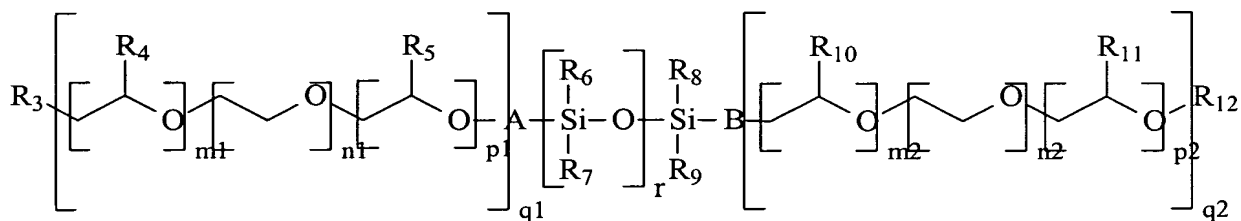
- m and p represent a number of alkylene oxide motifs less than or equal to 150,
- n is a number of ethylene oxide motifs less than or equal to 150,
- 25                   - q is a whole number at least equal to 1 and such that  $5 \leq (m+n+p)q \leq 150$ , and preferably such that  $15 \leq (m+n+p)q \leq 120$ ,
- R<sub>1</sub> is the hydrogen or the methyl or ethyl radical,
- R<sub>2</sub> is the hydrogen or the methyl or ethyl radical,

- R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- R' is the hydrogen or a hydrocarbon radical with 1 to 40 carbon atoms, and is preferably a hydrocarbon radical with 1 to 12 carbon atoms and very preferably a hydrocarbon radical with 1 to 4 carbon atoms,

or the mixture of a plurality of monomers with the formula (I),

- c) 0% to 50% of at least one monomer of the acrylamide or methacrylamide type and mixtures thereof, or at least one non water soluble monomer such as the alkyl acrylates or methacrylates, the vinyl esters such as vinyl acetate, vinylpyrrolidone, styrene, alphasubstituted styrene and derivatives thereof, or at least one organofluorine or organosilicon monomer selected preferably from the molecules with formulas (IIa) or (IIb):

with formula (IIa)



where:

- m1, p1, m2 and p2 represent a number of alkylene oxide motifs less than or equal to 150,
- n1 and n2 represent a number of ethylene oxide motifs less than or equal to 150,

- q1 and q2 represent a whole number at least equal to 1 and such that  $0 \leq (m1+n1+p1)q1 \leq 150$  and  $0 \leq (m2+n2+p2)q2 \leq 150$ ,
- r is a number such that  $1 \leq r \leq 200$ ,
- R<sub>3</sub> is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- R<sub>4</sub>, R<sub>5</sub>, R<sub>10</sub> and R<sub>11</sub>, represent hydrogen or the methyl or ethyl radical,
- R<sub>6</sub>, R<sub>7</sub>, R<sub>8</sub> and R<sub>9</sub>, represent linear or branched alkyl, or aryl, or alkylaryl, or arylalkyl groups with 1 to 20 carbon atoms, or mixtures thereof,
- R<sub>12</sub> is a hydrocarbon radical with 1 to 40 carbon atoms,
- A and B are groups that may be present, which then represent a hydrocarbon radical with 1 to 4 carbon atoms,

with the formula (IIb)



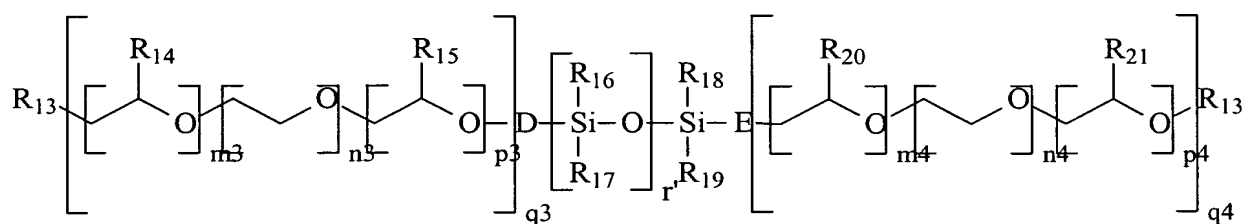
20

where:

- R is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane,  $\alpha$ - $\alpha'$  dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- A is a group that may be present, which then represents a hydrocarbon radical with 1 to 4 carbon atoms,
- B is a hydrocarbon radical with 1 to 4 carbon atoms,

or the mixture of a plurality of these monomers,

- d) 0 to 3% of at least one cross-linking monomer selected from the group consisting of ethylene glycol dimethacrylate, trimethylolpropanetriacrylate, allyl acrylate, allyl maleates, methylene-bis-acrylamide, methylene-bis-methacrylamide, tetrallyloxyethane, triallylcyanurates, allyl ethers obtained from polyols such as pentaerythritol, sorbitol, sucrose, or selected from molecules with the formula (III) :



(III)

where:

- m3, p3, m4 and p4 represent a number of alkylene oxide motifs less than or equal to 150,
- n3 and n4 represent a number of ethylene oxide motifs less than or equal to 150,
- q3 and q4 represent a whole number at least equal to 1 and such that  $0 \leq (m3+n3+p3)q3 \leq 150$  and  $0 \leq (m4+n4+p4)q4 \leq 150$ ,
- r' is a number such that  $1 \leq r' \leq 200$ ,
- R<sub>13</sub> is a radical containing a polymerizable unsaturated function, preferably belonging to the vinyl group and to the group of acrylic, methacrylic, maleic, itaconic, crotonic, vinylphthalic esters and to the group of unsaturated urethanes such as acrylurethane, methacrylurethane, α-α' dimethyl-isopropenyl-benzylurethane, allylurethane, and also to the group of allyl or vinyl ethers, substituted or not, or to the group of ethylenically unsaturated amides or imides,
- R<sub>14</sub>, R<sub>15</sub>, R<sub>20</sub> and R<sub>21</sub>, represent hydrogen or the methyl or ethyl radical,

- R<sub>16</sub>, R<sub>17</sub>, R<sub>18</sub> and R<sub>19</sub>, represent linear or branched alkyl, or aryl, or alkylaryl, or arylalkyl groups with 1 to 20 carbon atoms, or mixtures thereof,
- D and E are groups that may be present, which then represent a hydrocarbon radical with 1 to 4 carbon atoms, or the mixture of a plurality of these monomers.

19. A method for dispersing pigment and/or mineral fillers in aqueous suspension characterized in that the water soluble polymer according to one of claims 1 to 6 is used.

20. The method for dispersing pigments and/or mineral fillers in aqueous suspension according to claim 19, characterized in that 0.05 to 5% by dry weight of said polymer is used, and more particularly 0.1 to 3% by dry weight of said polymer is used, with respect to the dry weight of pigments and/or mineral fillers.

21. The method for dispersing pigments and/or mineral fillers according to either one of claims 19 or 20, characterized in that the pigment and/or mineral fillers are selected from natural or synthetic calcium carbonate, dolomites, kaolinite, talc, cement, gypsum, lime, magnesia, titanium oxide, satin white, aluminum trioxide or even aluminum trihydroxide, silicas, mica and the mixture of these fillers together, such as the talc-calcium carbonate, calcium carbonate-kaolinite mixtures, or even mixtures of calcium carbonate with aluminum trihydroxide or aluminum trioxide, or even mixtures with synthetic or natural fibers or even co-structures of minerals such as the talc-calcium carbonate or talc-titanium dioxide co-structures or mixtures thereof, and more particularly from natural calcium carbonate, synthetic calcium carbonate, and cement and very particularly from marble, calcite, chalk or mixtures thereof.

22. A method for grinding pigments and/or mineral fillers characterized in that the water soluble polymer according to one of claims 1 to 6 is used.

23. The method for grinding pigments and/or mineral fillers in aqueous suspension according to either one of claims 21 or 22, characterized in that 0.05 to 5% by dry weight of said polymer is used, and more particularly 0.1 to 3% by dry weight of said polymer is used, with respect to the dry weight of pigments and/or mineral fillers.

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24. The method for grinding pigments and/or mineral fillers according to either one of claims 22 or 23, characterized in that the pigment and/or mineral fillers are selected from natural or synthetic calcium carbonate, dolomites, kaolinite, talc, gypsum, lime, magnesia, titanium oxide, satin white, aluminum trioxide or even aluminum trihydroxide, silicas, mica and the mixture of these fillers together, such as the talc-calcium carbonate, calcium carbonate-kaolinite mixtures, or even mixtures of calcium carbonate with aluminum trihydroxide or aluminum trioxide, or even mixtures with synthetic or natural fibers or even co-structures of minerals such as the talc-calcium carbonate or talc-titanium dioxide co-structures or mixtures thereof, and more particularly from natural calcium carbonate, synthetic calcium carbonate, and very particularly from marble, calcite, chalk or mixtures thereof.

25. An aqueous dispersion of pigments and/or mineral fillers characterized in that it contains the water soluble polymer according to one of claims 1 to 6, and more particularly in that it contains 0.05 to 5% by dry weight of said polymer, and more particularly in that it contains 0.1 to 3% by dry weight of said polymer, with respect to the dry weight of pigments and/or mineral fillers.

26. The aqueous dispersion of pigments and/or mineral fillers according to claim 25, characterized in that the pigments and/or mineral fillers are selected from natural or synthetic calcium carbonate, dolomites, kaolinite, talc, cement, gypsum, lime, magnesia, titanium oxide, satin white, aluminum trioxide or even aluminum trihydroxide, silicas, mica and the mixture of these fillers together, such as the talc-calcium carbonate, calcium carbonate-kaolinite mixtures, or even mixtures of calcium carbonate with aluminum trihydroxide or aluminum trioxide, or even mixtures with synthetic or natural fibers or even co-structures of minerals such as the talc-calcium carbonate or talc-titanium dioxide co-structures or mixtures thereof, and more



particularly from natural calcium carbonate, synthetic calcium carbonate, and very particularly from marble, calcite, chalk or mixtures thereof.

27. An aqueous suspension of ground pigments and/or mineral fillers characterized in  
5 that it contains the water soluble polymer according to one of claims 1 to 6, and more particularly in that it contains 0.05 to 5% by dry weight of said polymer, and more particularly in that it contains 0.1 to 3% by dry weight of said polymer, with respect to the dry weight of pigments and/or mineral fillers.

10 28. The aqueous suspension of ground pigments and/or mineral fillers according to claim 27, characterized in that the pigment and/or mineral fillers are selected from natural or synthetic calcium carbonate, dolomites, kaolinite, talc, gypsum, lime, magnesia, titanium oxide, satin white, aluminum trioxide or even aluminum trihydroxide, silicas, mica and the mixture of these fillers together, such as the talc-  
15 calcium carbonate, calcium carbonate-kaolinite mixtures, or even mixtures of calcium carbonate with aluminum trihydroxide or aluminum trioxide, or even mixtures with synthetic or natural fibers or even co-structures of minerals such as the talc-calcium carbonate or talc-titanium dioxide co-structures or mixtures thereof, and more particularly from natural calcium carbonate, synthetic calcium carbonate, and very  
20 particularly from marble, calcite, chalk or mixtures thereof.

29. The use of aqueous dispersions of pigments and/or mineral fillers according to either one of claims 25 or 26 in the paper field such as the coating and bulk filling of the paper, water based paints, plastics, cement, ceramics and detergents.

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30. The use of aqueous suspensions of ground pigments and/ or mineral fillers according to either one of claims 27 or 28 in the paper field such as the coating and filling of the paper, water based paints, plastics, cement, ceramics and detergents.

30 31. A method for dispersing mineral matter in a paper formulation, in a water based paint, in a cement, in a ceramic composition, in a detergent composition, in a drilling

mud, characterized in that the water soluble polymer according to one of claims 1 to 6 is used.

32. The direct use, as dispersant, of the water soluble polymer put into practice in the method for dispersing mineral matter in paper formulations, water based paints, cements, ceramic composition, detergent compositions, cosmetic compositions, and drilling muds, according to claim 31.

33. A paper formulation containing 0.01 to 5% by dry weight of the water soluble polymer put into practice according to any one of claims 1 to 6 and 32.

34. A water based paint containing 0.01 to 5% by dry weight of the water soluble polymer put into practice according to any one of claims 1 to 6 and 32.

35. A plastic composition containing 0.01 to 5% by dry weight of the water soluble polymer put into practice according to anyone of Claims 1 to 6 and 32.

36. A cement containing 0.01 to 5% by dry weight of the water soluble polymer put into practice according to any one of claims 1 to 6 and 32.

37. A ceramic composition containing 0.01 to 5% by dry weight of the water soluble polymer put into practice according to any one of claims 1 to 6 and 32.

38. A detergent composition containing 0.01 to 5% by dry weight of the water soluble polymer put into practice according to any one of claims 1 to 6 and 32.

39. A cosmetic composition containing 0.01 to 5% by dry weight of the water soluble polymer put into practice according to any one of claims 1 to 6 and 32.

40. A drilling mud composition containing 0.01 to 5% by dry weight of the water soluble polymer put into practice according to any one of claims 1 to 6 and 32.